LOWER LEY CREEK SUBSITE
PRP NEXUS REPORT
CITY OF SYRACUSE

February 12, 2013

Compiled by:

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A Division of GZA GeoEnvironmental, Inc.

Contents

1.0 Overview

This PRP summary document presents evidence that has been collected by the United States Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation (NYSDEC) and others, concerning the disposal and/or release of hazardous substances to the Lower Ley Creek Subsite by the City of Syracuse. As described herein, the City of Syracuse once operated landfills along Lower Ley Creek, which were located in floodplain and swale areas. The constituents of concern (COCs) for Lower Ley Creek that have been identified by the United States Environmental Protection Agency (USEPA) include: polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile compounds (SVOCs), metals, and pesticides. Sampling in the footprint of the landfills and also in the vicinity of the landfills by the USEPA and NYSDEC has confirmed the presence of hazardous substances in soil and groundwater including the above mentioned COCs. The historic operation of sanitary landfills by the City of Syracuse in the proximity of Lower Ley Creek would have likely resulted in the disposal and release of hazardous substances, including leachate, which ultimately discharged into Ley Creek.

This document is a summary of data/evidence produced by others. Data sources for the information presented in this document are summarized in Section 6.0 References, and select supporting information is included in Appendix A. Additional information may be available from the City of Syracuse.

2.0 Executive Summary

A 1979 report prepared by Onondaga County documents the existence of a series of landfills once operated by the City of Syracuse along Lower Ley Creek. Newspaper articles and other reference sources provide additional information on the timeframes during which these landfills operated, as well as operational issues associated with the landfills. Two of the landfills in particular were located adjacent to Ley Creek; near Interstate 81 Highway/Seventh North Street and east of Seventh North Street. These areas were sampled in 2009, 2010 and 2011 and identified as floodplain/swale areas of concern by USEPA (USEPA, Figure 12). The landfills were reportedly poorly designed and operated, resulting in waste material, leachate, and potentially contaminated groundwater entering Ley Creek. Landfill-related waste and leachate would have contained a variety of hazardous substances typical to municipal waste, industrial waste and combustion ash.

Hazardous substances identified by USEPA in Lower Ley Creek and its floodplains include: PCBs, metals (including mercury), VOCs, SVOCs, and pesticides. Based on its ownership and/or operation of these landfills, and the likely releases of hazardous substances into and along Lower Ley Creek, the City of Syracuse should be given notice by the USEPA of its potential liability at the Lower Ley Creek Subsite.

3.0 Background and Overview of Historic City of Syracuse Landfill Operations

In 1979, Onondaga County conducted a review of active and closed landfills in the County and identified a series of landfills historically operated by the City of Syracuse adjacent to or near Lower Ley Creek. (See Figure 9, from *A Compilation of Landfill Practices in Onondaga County*, 1979). Onondaga County's report generally describes the location of these landfills as follows:

- 4th North St. – from Hiawatha Blvd. E. to Lemoyne Ave. Development: Industrial development. City and public dumped here.
- 6th North St. – Hiawatha Blvd. E. to Lemoyne Ave. Development: Industrial and commercial use. City and public dumped here.
- 7th North St. – from Wolf St. to Buckley Rd. Development: Still undeveloped. City and public dumped here. Started sometime in 1968, closed in late 1971. Final closure still needed according to letter of 1/3/73.
- Park St. – From Park St. to 7th North – Rte. 81 to Wolf St. Development: Industrial and commercial development – motel, truck warehouse, mobile homes. City and public dumped here. Started 3/64, completed sometime around 1971.

The County report indicates that these landfills were used for the disposal of municipal type waste, and "[a]ny industrial wastes received (sites adjacent to Hiawatha Boulevard and Seventh North Street received deliveries from several industries) were mixed with the domestic collections for disposal." However, "no stockpiling of barreled industrial waste have been reported."

Historic landfilling activities by the City of Syracuse along Ley Creek was also documented through local newspaper accounts. A January 26, 1964 article reports that the City of Syracuse was operating a landfill at Seventh North Street, but negotiating a 5 year lease for 105 acres in the Town of Salina off of the then-new Interstate 81 Highway between old Spring Street and Seventh North Street. Landfilling operations at the new location were expected to cover about 60% of the acreage, and the lease reportedly provided for the dumping of "ashes and waste materials" (Post-Standard, Jan. 26, 1964).

Prior to the opening of the landfill near Interstate 81, it was reported on February 9, 1964 that the City had remedied flagrant violations at its Seventh North Street sanitary landfill, including taking actions to remedy the problem of raw garbage entering Ley Creek. It was also reported that the City would be dredging Ley Creek to obtain fill cover for that landfill [1] (Post-Standard, Feb. 9, 1964).

On June 13, 1964, it was reported that the City would begin using its new 60-acre landfill at Seventh North St. and Route 81, with the land being chiefly of the swamp variety. A 5-year lease was reportedly entered into with Attilio Giarrusso for use of this property. The bulk of the City's overall disposal needs were expected to be met by this landfill once it became operational (Post-Standard, June 13, 1964).

A December 19, 1967 newspaper article reports that the City of Syracuse was then using its major landfill at the end of Park Street (near Route 81), with the site expected to be filled in another year. In 1966, the city reportedly buried 565,500 cubic yards of rubbish at this landfill. The City was in negotiations to lease 27 acres of marshland owned by East Plaza, Inc. for a new landfill. The City would need to construct a 670 feet roadway to the landfill from Seventh North Street (Post-Standard, Dec. 19, 1967).

[1] No records have been found to date confirming that this actually occurred.

On August 6, 1969, it was reported that the City of Syracuse claimed that it was no longer dumping at its Route 81 landfill; however a City truck was caught dumping tree branches there. The City claimed the mess at this landfill was due to the dumping of large quantities of construction and demolition debris by a private owner.[2] Although the City was still dumping on a very small section of the total landfill site, most of its dumping was being done on the new landfill site on Seventh North Street (Post-Standard, Aug. 6, 1969).

A day later, on August 7, 1969, it was reported that state officials were upset with the private dumping of demolition debris at the Route 81 landfill, as landfill operations had interfered with the normal flow of Ley Creek (by narrowing creek channels) through part of the landfill area(Post-Standard, Aug. 7, 1969).

Between 1970 and 1971, local newspapers periodically reported on a legal dispute between the City of Syracuse and the Town of Salina concerning the City's continued use of its Seventh North Street landfill. At issue was not only when the City would stop using the landfill but whether or not it was violating height restrictions on its waste disposal activities along Ley Creek. On February 17, 1971, a court order was issued holding that the City was in violation of its permit issued by the Town of Salina. On October 28, 1971, an appellate court issued a restraining order against the City, prohibiting the further use of the landfill. On November 10, 1971, it was reported that the City had decided to stop using its Seventh North Street landfill for good and "was out of the landfill business." (Post-Standard, Sept. 10, 1970; Sept. 12, 1970; Mar. 13, 1971; Nov. 5, 1971; Nov. 6, 1971; Nov. 10, 1971).

In summary, publicly available information indicates that the City of Syracuse once operated a series of landfills adjacent to or in close proximity of Lower Ley Creek. The locations of the City of Syracuse's landfills are shown on the figure prepared as part of Onondaga County's 1979 landfill report and can also be seen in historic aerial photographs (Figure 2 & 6)). The location of the City's landfill at Interstate 81 Highway/Seventh North Street is shown on Figure 1-2 of EPA's 1971 report titled *Onondaga Lake Study(Figure 11)*. A 1981 figure prepared by Calocerinos & Spina shows the location of the City of Syracuse's landfill east of Seventh North Street which was used from approximately 1967 to 1971 (Figure 10) (All of these figures and aerial photographs are included in Appendix A)

The Interstate 81 Highway/Park Street landfill and the Seventh North Street (East Plaza property) landfill were located in the floodplains along Ley Creek. The locations and extent of these two landfills within the floodplain of Lower Ley Creek are observed from 1966 and 1972 aerial photographs and are included as Figures 1,2 and 6 in Appendix A.

[2] The dumping of construction and demolition debris by the City and/or others at this landfill was confirmed in a 1989 report prepared for Allied-Signal, Inc. by Blasland & Bouck Engineers, P.C. *Hydrogeologic Assessment of the Allied Waste Beds in the Syracuse Area, Volume I, April 1989.* It was noted in that report that "[o]bservations made during a reconnaissance of the Ley Creek Area (L) indicated that extensive dumping of construction and demolition debris had recently occurred in this area. Numerous piles of siding, blacktop, and concrete rubble, shingles, etc. were observed. Vegetative growth was moderately well-developed in this area with cobbles and gravel exposed at the ground surface, along with concrete rubble and brick. A steep bank along the northwest side of Ley Creek, approximately 9 feet high, exposed concrete and brick rubble. Based on this information, it appears that Area L has been used as a construction and demolition disposal area for some time."

Investigations by USEPA in 2010 and 2011 confirmed the presence of hazardous substances, many of them above soil, sediment and surface water standards, criteria, and guidance (SCGs). The impact from landfill operations on Ley Creek and surrounding areas were anecdotally documented in the above-described publicly available records, and are described in more detail below.

3.1 Geology/ Hydrogeology

The lands adjacent to Lower Ley Creek historically were low-lying wetlands that were subsequently reclaimed by filling in these areas with municipal and industrial solid wastes and construction debris. As seen on the 1958 topographic map (Figure 7), the general areas where landfill operations occurred are identified as wetlands. The 1973 topographic map (Figure 8) no longer identifies these areas as wetlands and the influence of fill material is now evident based on the presence of contours indicating elevation changes.

Subsurface investigations in the vicinity of the Interstate 81/Park Street landfill and the Seventh North Street landfill (East Plaza property) were summarized by M.G Perkins and E.A. Romanowicz in the Limnological and Engineering Analysis of a Polluted Urban Lake, 1996 (p. 49):

"Approximately 1.1 miles upstream of Onondaga Lake, the stratigraphic column shows 15 ft of fill material (foundry sands, municipal wastes and wood) underlain by 5 ft of a high-conductivity peat (2.7 x 10^{-3} $cm \cdot s^{-1}$;7.7$ft \cdot d^{-1}$) and 30 ft. of sand and silt. At the base of the sand and silt unit is approximately 50 ft. of sand and gravel underlain by bedrock (Veron shale) at an approximate depth of 100 ft.) (Engineering Science, Inc. 1983). Approximately 2,000 ft. northeast of Onondaga Lake, the surficial materials consist of 8 ft. of fill (cinders, silt, fine-to-coarse sand, fine-to-medium gravel, wood, and rubble), underlain by 12 ft. of a gray, wet, soft marl with some sand and peat. At a depth of approximately 20 ft., 5 ft. of marl grading to silt occurs and is underlain by over 60 ft. of silt grading to sand and then sand grading to fine gravel (Calocerinos and Spina Engineers, 1988)."

3.2 Surface Water Hydrology

Site investigations at the two former City of Syracuse landfill sites have not been conducted, therefore surface water flow has not been characterized.

3.3 Documented City of Syracuse Landfill-Related Discharges to Ley Creek

A February 9, 1964 newspaper article reports that the City of Syracuse had been releasing raw garbage into Ley Creek from one of the landfills it was operating near Seventh North Street (Post-Standard, Feb. 9, 1964). In a March 12, 1966 report titled *An Environmental Assessment of Onondaga Lake and its Major Contributing Streams,* the Onondaga Lake Scientific Counsel reported the following conditions along Ley Creek at the City's landfill between Park Street and Seventh North Street:

> *Bridge #1 – Park St.*
>
> *Creek, conditions sluggish, is approximately 15 to 20 ft. wide at this point.* ***The water is turbid with a heavy oil slick and noticeable odor. A D.P.W. dump borders on northwest side, extending through to North Street opposite the Ley Creek Treatment Plant.***

Bridge #2 – 7th North St.

> ***The dump on the northwest bank is being used as a land fill operation.*** *Adjacent to the Ley Creek Treatment Plant some dumping of chemical wastes and asphalt paving materials has taken place.* ***Surface run-off water was observed running into the stream in a highly contaminated condition.***

Based on these and related inspection findings along Ley Creek, the Onondaga Lake Scientific Counsel specifically admonished that ***"[d]umping and sanitary landfilling operations must be conducted so that they do not contribute to the pollution of Ley Creek."***[3]

In 1971, USEPA released a report titled *Onondaga Lake Study*. This report identified the City of Syracuse's Interstate 81 Highway/Park Street landfill as a source of contamination to Onondaga Lake (via Ley Creek), noting as follows:

> *Separate chemical analyses were conducted on a stream emanating from an extensive landfill operation located just north of the Ley Creek discharge.* ***These analyses showed high BOD and nitrogen concentrations. It was noted that amounts discharged by Ley Creek [to Onondaga Lake] substantially exceed amounts discharged from the Ley Creek Treatment Plant in many cases. These differences could be accounted for by leaching of this landfill operation.***

Based on these findings, USEPA recommended that additional measures be taken to reduce the BOD discharges emanating from Ley Creek such as ***"sealing areas of the creek where portions of leachate enter the creek."***

3.4 Hazardous Substances in Landfill-Related Waste and Leachate

Constituents found in Municipal Solid Waste Landfills (MSWLFs) that were in operation prior to the 1980 promulgation of the Subtitle C waste regulations, can vary widely because of the unregulated acceptance of municipal, industrial and construction debris. EPA's *Summary of Data on Municipal Solid Waste Landfill Leachate Characteristics (July 1988)* characterized MSWLF leachate by determining the number of constituents detected in different constituent categories. According to the 1988 USEPA report, hazardous substances that are representative of pre-1980 landfill operations include, but are not limited to: arsenic, barium, cadmium, chromium, copper, cyanide, lead, manganese, mercury ,nickel, vanadium, zinc, acetone, benzene, 2-Butanone (MEK), p- Creosol, diethyl phthalate, ethyl benzene, methylene chloride, phenol, toluene, M-xylene, and xylenes.

4.0 Areas of Concern

The approximate extent and boundary of the interstate 81/Park Street Landfill and the Seventh North Landfill were estimated on Figures 1 and 2 by using aerials from 1966 and 1972 by observing areas of land disturbance. Investigations by USEPA in 2009, 2010 and 2011 confirmed the presence of hazardous

[3] During the year in which these inspection findings were noted, the City of Syracuse reportedly buried 565,500 cubic yards of waste at its landfill located along Park Street to Seventh North Street (Post-Standard, Dec. 19, 1967).

substances within both footprints of the former City of Syracuse landfills (Figures 2-5) that are consistent with the constituents of concern identified at the Lower Ley Creek subsite.

4.1 Soils

Sampling results from the 2010 and 2011 USEPA surveys indicate that at the Seventh North landfill site, the following maximum soil concentrations were identified: total PCBs (500 mg/kg), arsenic (15.4 mg/kg), cadmium (14.7 mg/kg), chromium (5,320 mg/kg), copper (1,520 mg/kg), lead (589 mg/kg), nickel (1,230 mg/kg), silver (11.7 mg/kg), zinc (865 mg/kg),cyanide (21.4 mg/kg), acenaphthene (2,800 µg/kg) anthracene (6,500 µg/kg), benzo(a)pyrene (14,000 µg/kg), benzo(b)floranthene (18,000 µg/kg), benzo(g,h,i)perylene (6,400 µg/kg), benzo(k)floranthene (5,200 µg/kg),chrysene (18,000 µg/kg), fluoranthene (45,000 µg/kg), fluorine(3,500 µg/kg)), indeno (1,2,3-cd)pyrene (6,400 µg/kg), phenanthrene (34,000 µg/kg), and pyrene (34,000 µg/kg).

The Interstate 81/ Park Street landfill site had the following maximum concentrations: arsenic (12.2 mg/kg), chromium (20.4 mg/kg), copper (110 mg/kg), lead (463 mg/kg), mercury (1.5 mg/kg), nickel (31.6 mg/kg), zinc (207 mg/kg), anthracene (2,330 µg/kg), benzo(a)pyrene (5,300 µg/kg), benzo(b)floranthene (4,610 µg/kg), benzo(g,h,i)perylene (3,850 µg/kg), benzo(k)floranthene (4,790 µg/kg), chrysene (5,200 µg/kg), fluoranthene (9,800 µg/kg), indeno (1,2,3-cd)pyrene (3,530 µg/kg), phenanthrene (7,450 µg/kg), and pyrene (8,650 µg/kg). Out of the four samples taken within the footprint of the landfill site, there were no values of total PCBs above 1 mg/kg.

Figures 2-5 included in the appendix summarize detected results of selected constituents of concern from USEPA's sampling efforts (PCBs, metals and PAHs) within the footprint of the historic landfill sites.

4.2 Sediment Sampling

According to the Lower Ley Creek Subsite Evaluation from 2010, sediment sampling conducted in 2009 in the lower portion of Ley Creek by the USEPA detected the presence of the following: PCBs (up to 43 mg/kg), cadmium (462 mg/kg), chromium (1,090 mg/kg) copper (525 mg/kg), lead (856 mg/kg), mercury (2.1 mg/kg), nickel (447 mg/kg),zinc (4,430 mg/kg), pyrene (100,000 µg/kg), and fluoranthene (130,000 µg/kg).

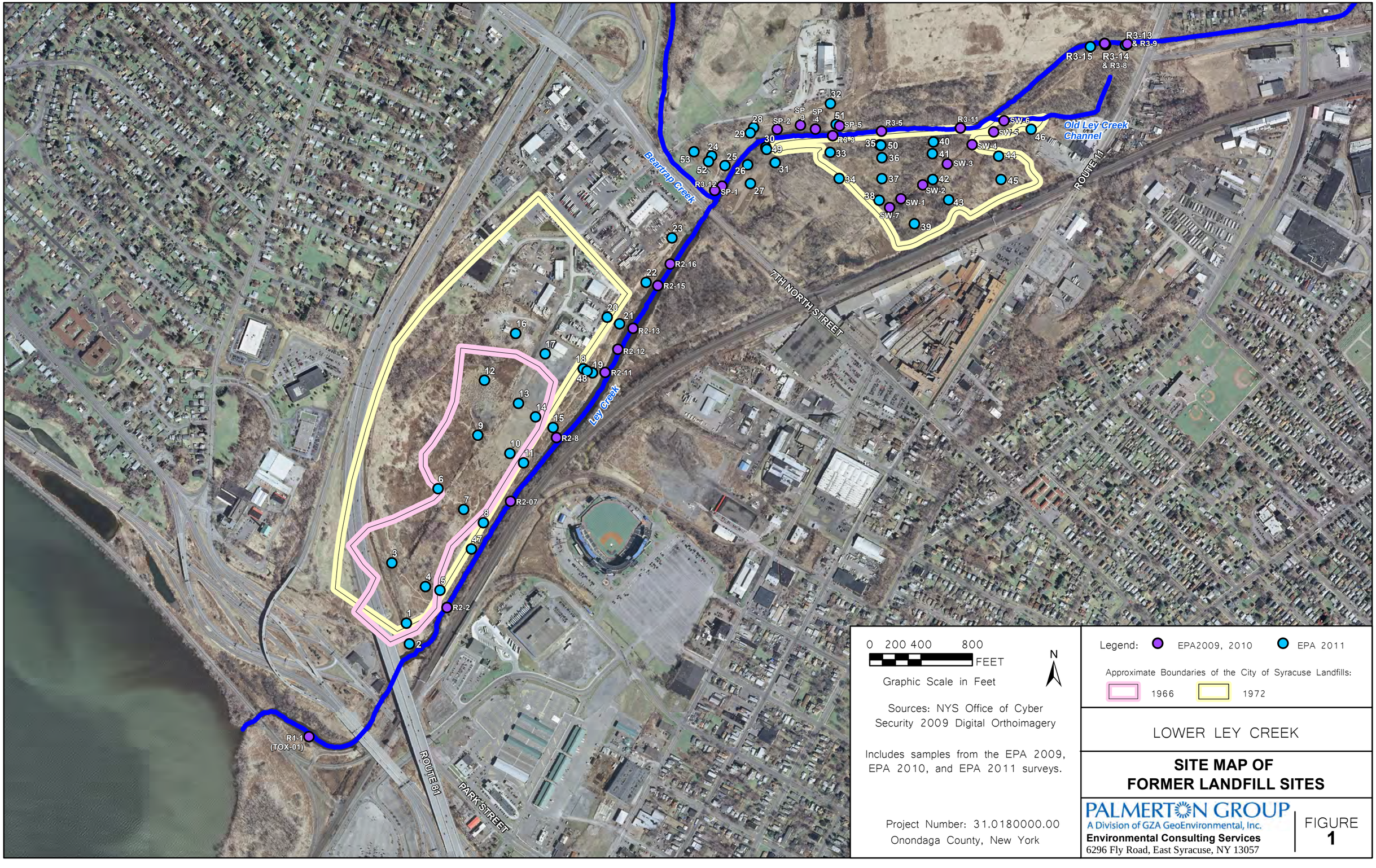
5.0 Conclusions

Based on available evidence, the City of Syracuse's nexus to the Lower Ley Creek Subsite includes its ownership and/or operation of the landfills described herein which were located adjacent to and/or near Ley Creek. In particular, the City operated a landfill along the north bank of Ley Creek between Interstate 81 and Park Street, and a landfill along the south bank of Ley Creek east of Seventh North Street (Figure 1). Recent investigations by the USEPA in these areas have confirmed the presence of hazardous substances that include: PCBs, metals (including mercury), VOCs, SVOCs, and pesticides. The proximity of the landfill as well as the historic releases of waste material and/or leachate from the landfills demonstrates the pathway for contamination at the Lower Ley Creek Subsite. Accordingly, the City of Syracuse should be given notice by USEPA of its potential liability at the Lower Ley Creek Subsite.

6.0 References

Information found in this report has been summarized from *A Compilation of Landfill Practices in Onondaga County* prepared by Onondaga County's Department of Health, Division of Environmental Sanitation, in 1979; newspaper articles; aerial photographs; and miscellaneous historic reports related to Onondaga Lake, including a 1971 report prepared by USEPA titled *Onondaga Lake Study* and a March 12, 1966 report prepared by the Onondaga Lake Scientific Counsel titled *An Environmental Assessment of Onondaga Lake and its Major Contributing Streams,* and *Limnological and Engineering Analysis of a Polluted Urban Lake, prelude to Environmental Management of Onondaga Lake, New York,* Steven W. Effler 1996. Additional information on the City of Syracuse's historic landfilling practices along Lower Ley Creek may be available from the City of Syracuse, Onondaga County, NYSDEC, USEPA, and litigation files relating to past lawsuits filed in association with these landfills. Copies of relevant documents used in the report are provided on CD.

Appendix A



0 200 400 800
FEET

Graphic Scale in Feet

N

Sources: NYS Office of Cyber Security 2009 Digital Orthoimagery

Includes samples from the EPA 2009, EPA 2010, and EPA 2011 surveys.

Project Number: 31.0180000.00
Onondaga County, New York

Legend: EPA2009, 2010 EPA 2011

Approximate Boundaries of the City of Syracuse Landfills:
1966 1972

LOWER LEY CREEK

SITE MAP OF FORMER LANDFILL SITES

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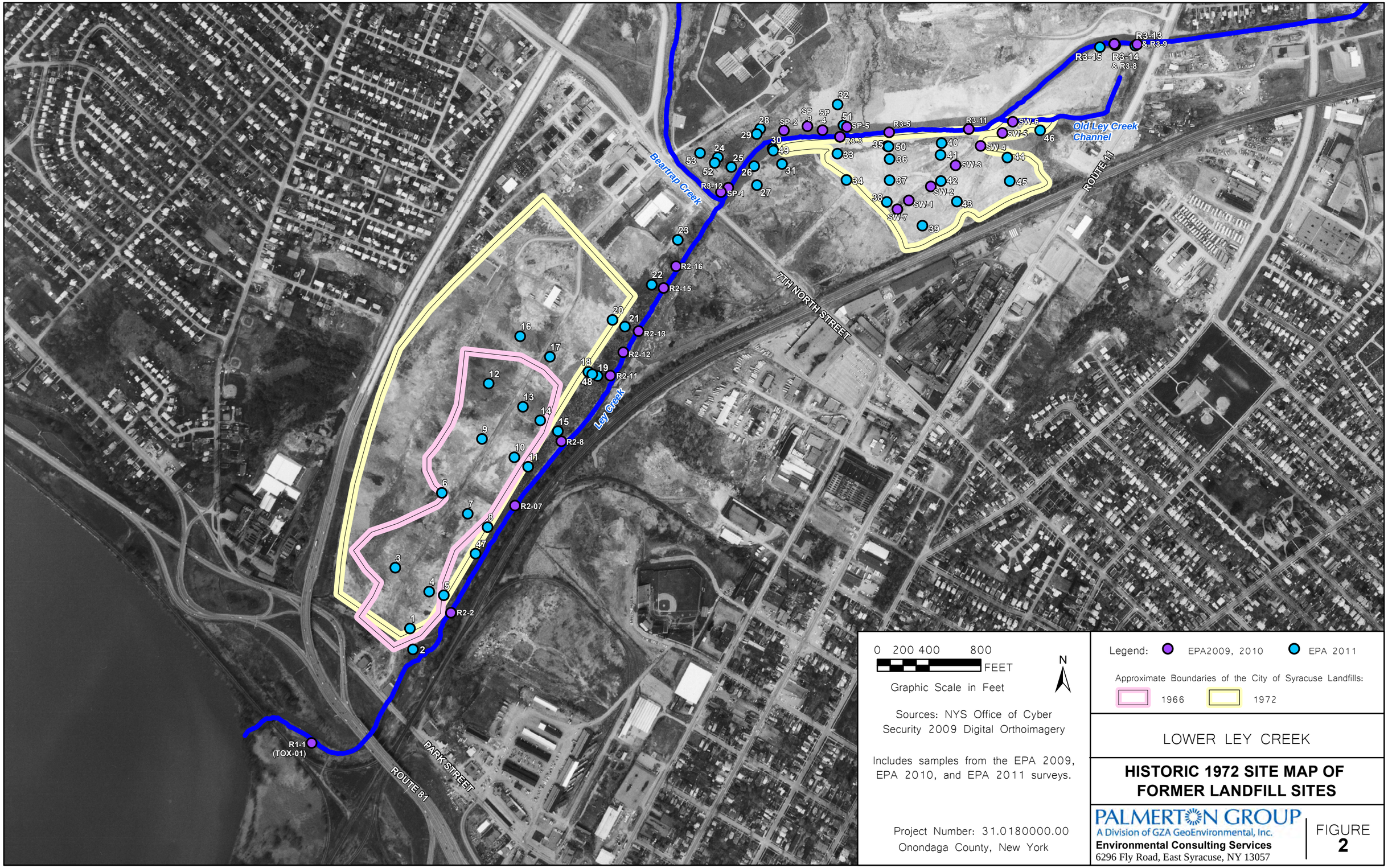
FIGURE
1



0 200 400 800
FEET

Graphic Scale in Feet

N

Sources: NYS Office of Cyber Security 2009 Digital Orthoimagery

Includes samples from the EPA 2009, EPA 2010, and EPA 2011 surveys.

Project Number: 31.0180000.00
Onondaga County, New York

Legend: EPA2009, 2010 EPA 2011

Approximate Boundaries of the City of Syracuse Landfills:
1966 1972

LOWER LEY CREEK

HISTORIC 1972 SITE MAP OF FORMER LANDFILL SITES

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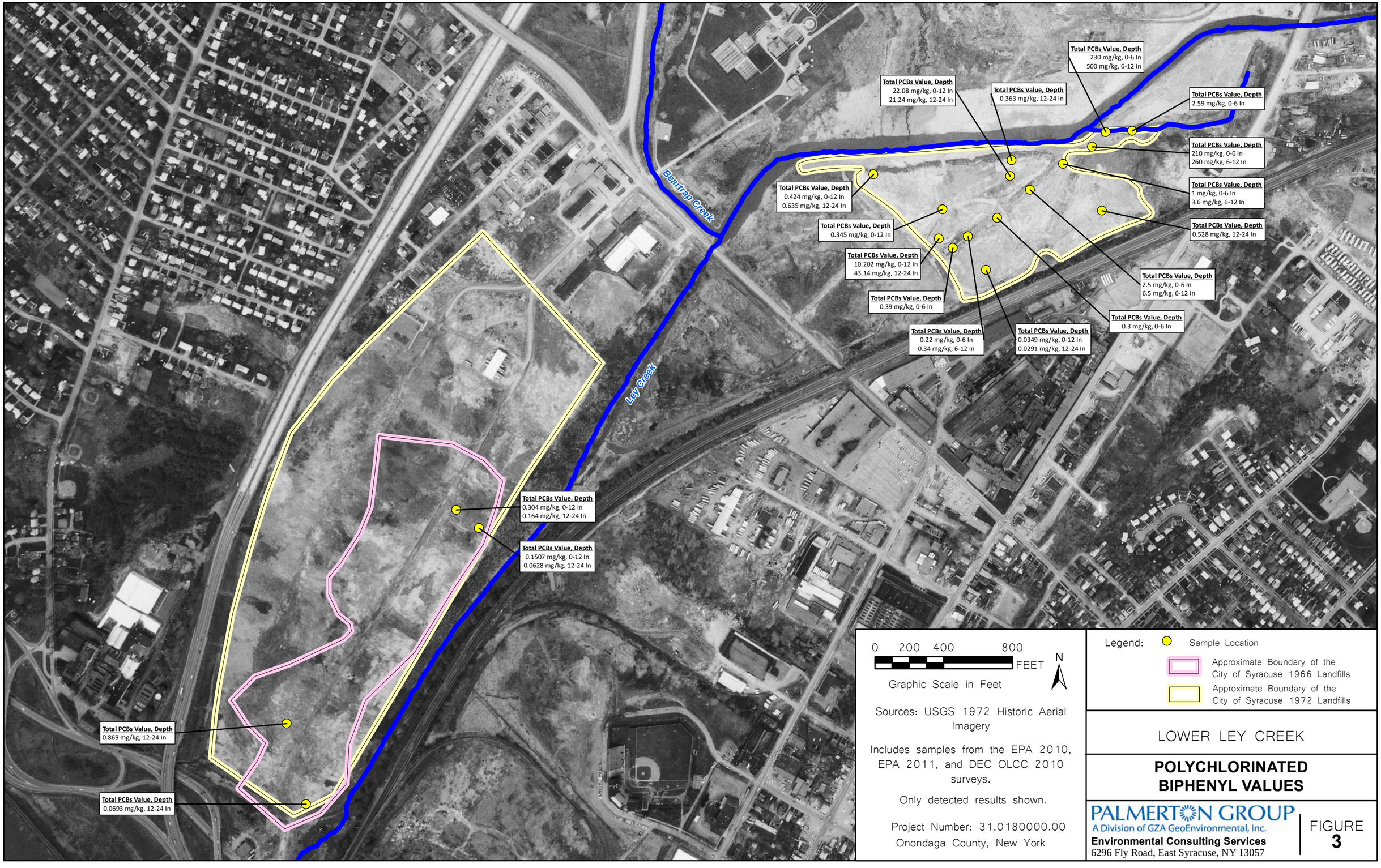
FIGURE 2



0 200 400 800 FEET

N

Graphic Scale in Feet

Sources: USGS 1972 Historic Aerial Imagery

Includes samples from the EPA 2010, EPA 2011, and DEC OLCC 2010 surveys.

Only detected results shown.

Project Number: 31.0180000.00

Onondaga County, New York

Legend:

- Sample Location
- Approximate Boundary of the City of Syracuse 1966 Landfills
- Approximate Boundary of the City of Syracuse 1972 Landfills

LOWER LEY CREEK

POLYCHLORINATED BIPHENYL VALUES

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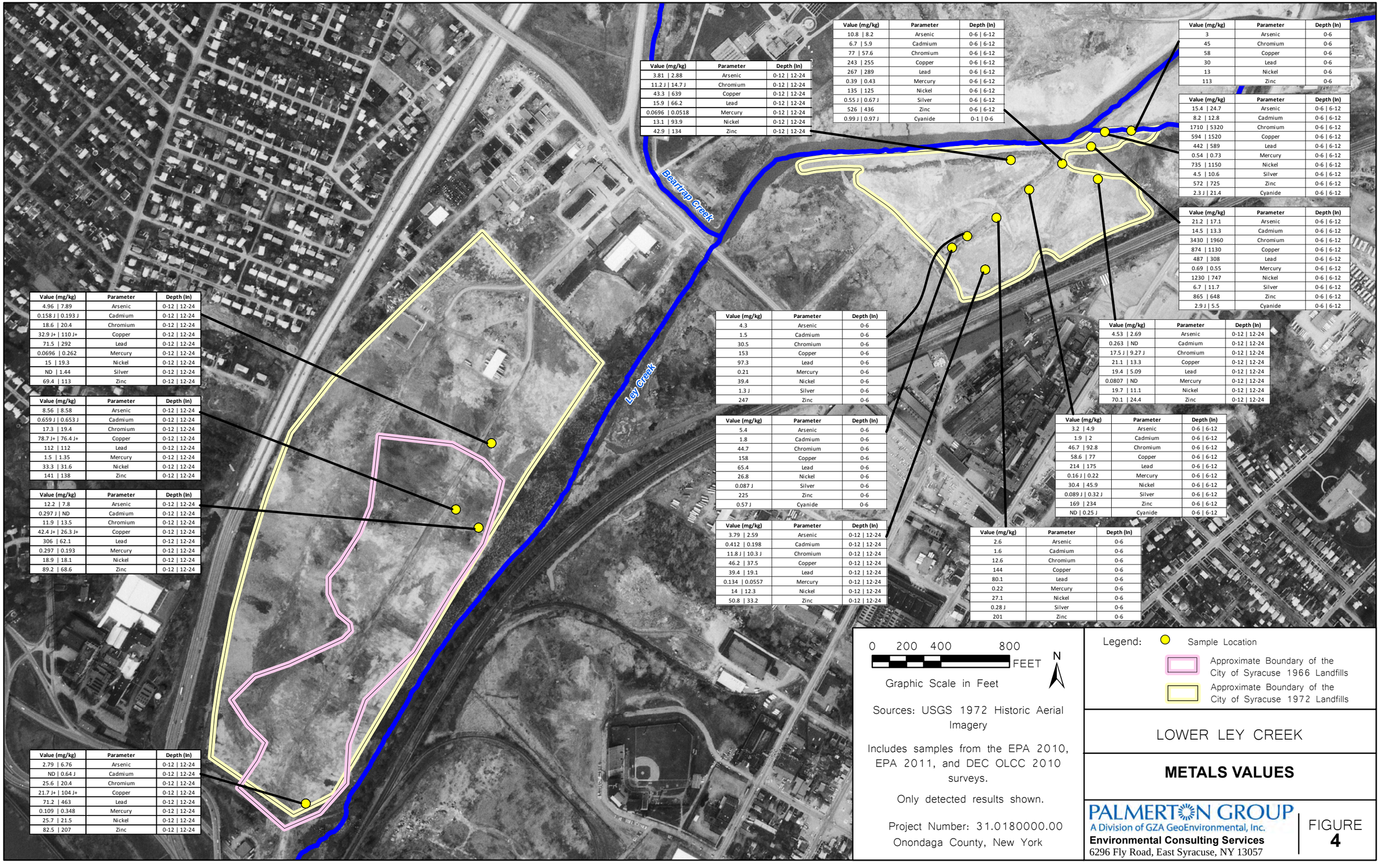
FIGURE 3



Value (mg/kg)	Parameter	Depth (In)
4.96 | 7.89	Arsenic	0-12 | 12-24
0.158 J | 0.193 J	Cadmium	0-12 | 12-24
18.6 | 20.4	Chromium	0-12 | 12-24
32.9 J+ | 110 J+	Copper	0-12 | 12-24
71.5 | 292	Lead	0-12 | 12-24
0.0696 | 0.262	Mercury	0-12 | 12-24
15 | 19.3	Nickel	0-12 | 12-24
ND | 1.44	Silver	0-12 | 12-24
69.4 | 113	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
8.56 | 8.58	Arsenic	0-12 | 12-24
0.659 J | 0.653 J	Cadmium	0-12 | 12-24
17.3 | 19.4	Chromium	0-12 | 12-24
78.7 J+ | 76.4 J+	Copper	0-12 | 12-24
112 | 112	Lead	0-12 | 12-24
1.5 | 1.35	Mercury	0-12 | 12-24
33.3 | 31.6	Nickel	0-12 | 12-24
141 | 138	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
12.2 | 7.8	Arsenic	0-12 | 12-24
0.297 J | ND	Cadmium	0-12 | 12-24
11.9 | 13.5	Chromium	0-12 | 12-24
42.4 J+ | 26.3 J+	Copper	0-12 | 12-24
306 | 62.1	Lead	0-12 | 12-24
0.297 | 0.193	Mercury	0-12 | 12-24
18.9 | 18.1	Nickel	0-12 | 12-24
89.2 | 68.6	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
2.79 | 6.76	Arsenic	0-12 | 12-24
ND | 0.64 J	Cadmium	0-12 | 12-24
25.6 | 20.4	Chromium	0-12 | 12-24
21.7 J+ | 104 J+	Copper	0-12 | 12-24
71.2 | 463	Lead	0-12 | 12-24
0.109 | 0.348	Mercury	0-12 | 12-24
25.7 | 21.5	Nickel	0-12 | 12-24
82.5 | 207	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
3.81 | 2.88	Arsenic	0-12 | 12-24
11.2 J | 14.7 J	Chromium	0-12 | 12-24
43.3 | 639	Copper	0-12 | 12-24
15.9 | 66.2	Lead	0-12 | 12-24
0.0696 | 0.0518	Mercury	0-12 | 12-24
13.1 | 93.9	Nickel	0-12 | 12-24
42.9 | 134	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
10.8 | 8.2	Arsenic	0-6 | 6-12
6.7 | 5.9	Cadmium	0-6 | 6-12
77 | 57.6	Chromium	0-6 | 6-12
243 | 255	Copper	0-6 | 6-12
267 | 289	Lead	0-6 | 6-12
0.39 | 0.43	Mercury	0-6 | 6-12
135 | 125	Nickel	0-6 | 6-12
0.55 J | 0.67 J	Silver	0-6 | 6-12
526 | 436	Zinc	0-6 | 6-12
0.99 J | 0.97 J	Cyanide	0-1 | 0-6

Value (mg/kg)	Parameter	Depth (In)
3	Arsenic	0-6
45	Chromium	0-6
58	Copper	0-6
30	Lead	0-6
13	Nickel	0-6
113	Zinc	0-6

Value (mg/kg)	Parameter	Depth (In)
15.4 | 24.7	Arsenic	0-6 | 6-12
8.2 | 12.8	Cadmium	0-6 | 6-12
1710 | 5320	Chromium	0-6 | 6-12
594 | 1520	Copper	0-6 | 6-12
442 | 589	Lead	0-6 | 6-12
0.54 | 0.73	Mercury	0-6 | 6-12
735 | 1150	Nickel	0-6 | 6-12
4.5 | 10.6	Silver	0-6 | 6-12
572 | 725	Zinc	0-6 | 6-12
2.3 J | 21.4	Cyanide	0-6 | 6-12

Value (mg/kg)	Parameter	Depth (In)
21.2 | 17.1	Arsenic	0-6 | 6-12
14.5 | 13.3	Cadmium	0-6 | 6-12
3430 | 1960	Chromium	0-6 | 6-12
874 | 1130	Copper	0-6 | 6-12
487 | 308	Lead	0-6 | 6-12
0.69 | 0.55	Mercury	0-6 | 6-12
1230 | 747	Nickel	0-6 | 6-12
6.7 | 11.7	Silver	0-6 | 6-12
865 | 648	Zinc	0-6 | 6-12
2.9 J | 5.5	Cyanide	0-6 | 6-12

Value (mg/kg)	Parameter	Depth (In)
4.3	Arsenic	0-6
1.5	Cadmium	0-6
30.5	Chromium	0-6
153	Copper	0-6
97.3	Lead	0-6
0.21	Mercury	0-6
39.4	Nickel	0-6
1.3 J	Silver	0-6
247	Zinc	0-6

Value (mg/kg)	Parameter	Depth (In)
5.4	Arsenic	0-6
1.8	Cadmium	0-6
44.7	Chromium	0-6
158	Copper	0-6
65.4	Lead	0-6
26.8	Nickel	0-6
0.087 J	Silver	0-6
225	Zinc	0-6
0.57 J	Cyanide	0-6

Value (mg/kg)	Parameter	Depth (In)
3.79 | 2.59	Arsenic	0-12 | 12-24
0.412 | 0.198	Cadmium	0-12 | 12-24
11.8 J | 10.3 J	Chromium	0-12 | 12-24
46.2 | 37.5	Copper	0-12 | 12-24
39.4 | 19.1	Lead	0-12 | 12-24
0.134 | 0.0557	Mercury	0-12 | 12-24
14 | 12.3	Nickel	0-12 | 12-24
50.8 | 33.2	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
4.53 | 2.69	Arsenic	0-12 | 12-24
0.263 | ND	Cadmium	0-12 | 12-24
17.5 J | 9.27 J	Chromium	0-12 | 12-24
21.1 | 13.3	Copper	0-12 | 12-24
19.4 | 5.09	Lead	0-12 | 12-24
0.0807 | ND	Mercury	0-12 | 12-24
19.7 | 11.1	Nickel	0-12 | 12-24
70.1 | 24.4	Zinc	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
3.2 | 4.9	Arsenic	0-6 | 6-12
1.9 | 2	Cadmium	0-6 | 6-12
46.7 | 92.8	Chromium	0-6 | 6-12
58.6 | 77	Copper	0-6 | 6-12
214 | 175	Lead	0-6 | 6-12
0.16 J | 0.22	Mercury	0-6 | 6-12
30.4 | 45.9	Nickel	0-6 | 6-12
0.089 J | 0.32 J	Silver	0-6 | 6-12
169 | 234	Zinc	0-6 | 6-12
ND | 0.25 J	Cyanide	0-6 | 6-12

Value (mg/kg)	Parameter	Depth (In)
2.6	Arsenic	0-6
1.6	Cadmium	0-6
12.6	Chromium	0-6
144	Copper	0-6
80.1	Lead	0-6
0.22	Mercury	0-6
27.1	Nickel	0-6
0.28 J	Silver	0-6
201	Zinc	0-6

0 200 400 800 FEET

N

Graphic Scale in Feet

Sources: USGS 1972 Historic Aerial Imagery

Includes samples from the EPA 2010, EPA 2011, and DEC OLCC 2010 surveys.

Only detected results shown.

Project Number: 31.0180000.00

Onondaga County, New York

Legend:

- Sample Location
- Approximate Boundary of the City of Syracuse 1966 Landfills
- Approximate Boundary of the City of Syracuse 1972 Landfills

LOWER LEY CREEK

METALS VALUES

PALMERTON GROUP
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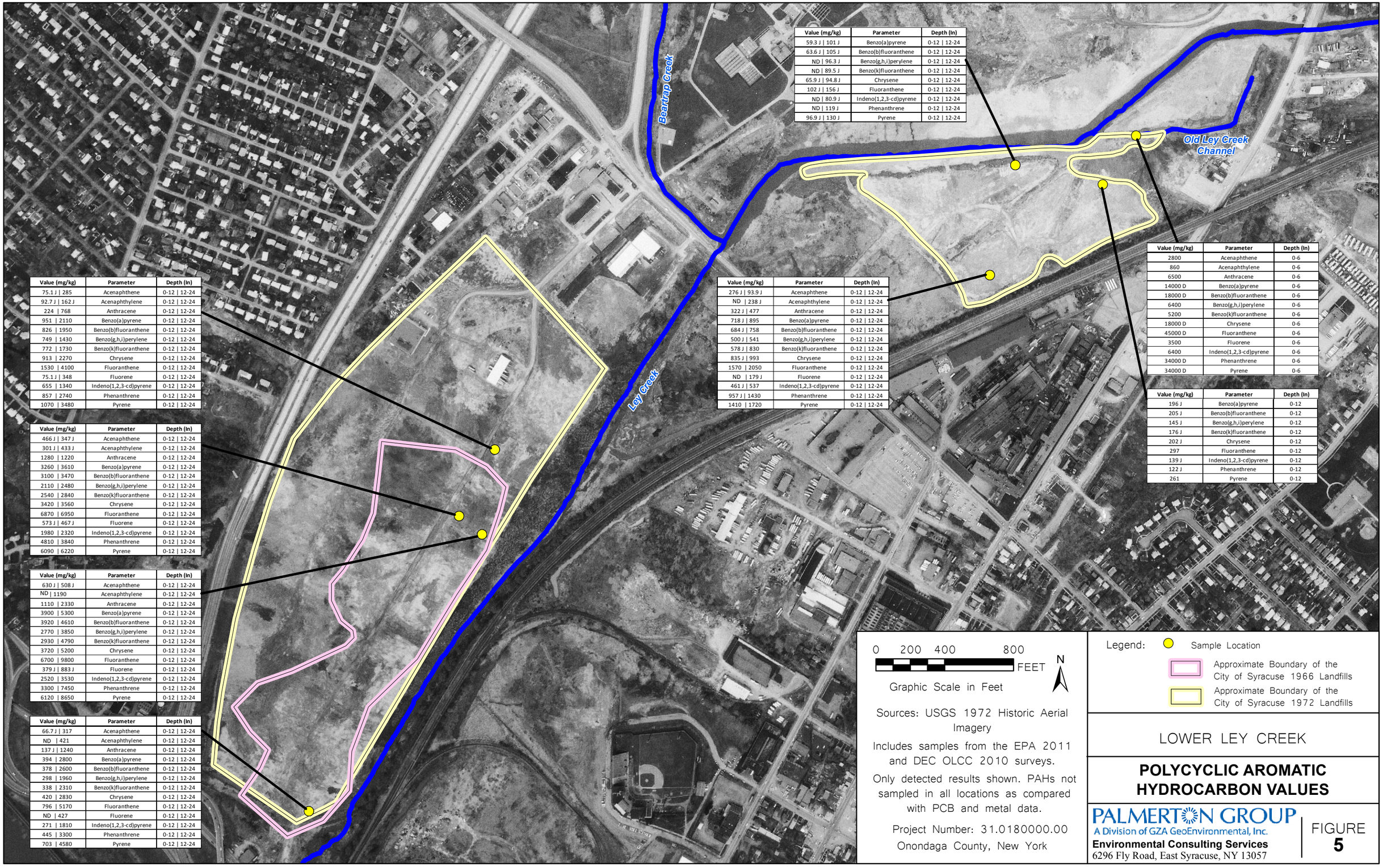
Environmental Consulting Services
6296 Fly Road, East Syracuse, NY 13057

FIGURE 4



Value (mg/kg)	Parameter	Depth (In)
59.3 J | 101 J	Benzo(a)pyrene	0-12 | 12-24
63.6 J | 105 J	Benzo(b)fluoranthene	0-12 | 12-24
ND | 96.3 J	Benzo(g,h,i)perylene	0-12 | 12-24
ND | 89.5 J	Benzo(k)fluoranthene	0-12 | 12-24
65.9 J | 94.8 J	Chrysene	0-12 | 12-24
102 J | 156 J	Fluoranthene	0-12 | 12-24
ND | 80.9 J	Indeno(1,2,3-cd)pyrene	0-12 | 12-24
ND | 119 J	Phenanthrene	0-12 | 12-24
96.9 J | 130 J	Pyrene	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
276 J | 93.9 J	Acenaphthene	0-12 | 12-24
ND | 238 J	Acenaphthylene	0-12 | 12-24
322 J | 477	Anthracene	0-12 | 12-24
718 J | 895	Benzo(a)pyrene	0-12 | 12-24
684 J | 758	Benzo(b)fluoranthene	0-12 | 12-24
500 J | 541	Benzo(g,h,i)perylene	0-12 | 12-24
578 J | 830	Benzo(k)fluoranthene	0-12 | 12-24
835 J | 993	Chrysene	0-12 | 12-24
1570 | 2050	Fluoranthene	0-12 | 12-24
ND | 179 J	Fluorene	0-12 | 12-24
461 J | 537	Indeno(1,2,3-cd)pyrene	0-12 | 12-24
957 J | 1430	Phenanthrene	0-12 | 12-24
1410 | 1720	Pyrene	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
2800	Acenaphthene	0-6
860	Acenaphthylene	0-6
6500	Anthracene	0-6
14000 D	Benzo(a)pyrene	0-6
18000 D	Benzo(b)fluoranthene	0-6
6400	Benzo(g,h,i)perylene	0-6
5200	Benzo(k)fluoranthene	0-6
18000 D	Chrysene	0-6
45000 D	Fluoranthene	0-6
3500	Fluorene	0-6
6400	Indeno(1,2,3-cd)pyrene	0-6
34000 D	Phenanthrene	0-6
34000 D	Pyrene	0-6

Value (mg/kg)	Parameter	Depth (In)
196 J	Benzo(a)pyrene	0-12
205 J	Benzo(b)fluoranthene	0-12
145 J	Benzo(g,h,i)perylene	0-12
176 J	Benzo(k)fluoranthene	0-12
202 J	Chrysene	0-12
297	Fluoranthene	0-12
139 J	Indeno(1,2,3-cd)pyrene	0-12
122 J	Phenanthrene	0-12
261	Pyrene	0-12

Value (mg/kg)	Parameter	Depth (In)
75.1 J | 285	Acenaphthene	0-12 | 12-24
92.7 J | 162 J	Acenaphthylene	0-12 | 12-24
224 | 768	Anthracene	0-12 | 12-24
951 | 2110	Benzo(a)pyrene	0-12 | 12-24
826 | 1950	Benzo(b)fluoranthene	0-12 | 12-24
749 | 1430	Benzo(g,h,i)perylene	0-12 | 12-24
772 | 1730	Benzo(k)fluoranthene	0-12 | 12-24
913 | 2270	Chrysene	0-12 | 12-24
1530 | 4100	Fluoranthene	0-12 | 12-24
75.1 J | 348	Fluorene	0-12 | 12-24
655 | 1340	Indeno(1,2,3-cd)pyrene	0-12 | 12-24
857 | 2740	Phenanthrene	0-12 | 12-24
1070 | 3480	Pyrene	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
466 J | 347 J	Acenaphthene	0-12 | 12-24
301 J | 433 J	Acenaphthylene	0-12 | 12-24
1280 | 1220	Anthracene	0-12 | 12-24
3260 | 3610	Benzo(a)pyrene	0-12 | 12-24
3100 | 3470	Benzo(b)fluoranthene	0-12 | 12-24
2110 | 2480	Benzo(g,h,i)perylene	0-12 | 12-24
2540 | 2840	Benzo(k)fluoranthene	0-12 | 12-24
3420 | 3560	Chrysene	0-12 | 12-24
6870 | 6950	Fluoranthene	0-12 | 12-24
573 J | 467 J	Fluorene	0-12 | 12-24
1980 | 2320	Indeno(1,2,3-cd)pyrene	0-12 | 12-24
4810 | 3840	Phenanthrene	0-12 | 12-24
6090 | 6220	Pyrene	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
630 J | 508 J	Acenaphthene	0-12 | 12-24
ND | 1190	Acenaphthylene	0-12 | 12-24
1110 | 2330	Anthracene	0-12 | 12-24
3900 | 5300	Benzo(a)pyrene	0-12 | 12-24
3920 | 4610	Benzo(b)fluoranthene	0-12 | 12-24
2770 | 3850	Benzo(g,h,i)perylene	0-12 | 12-24
2930 | 4790	Benzo(k)fluoranthene	0-12 | 12-24
3720 | 5200	Chrysene	0-12 | 12-24
6700 | 9800	Fluoranthene	0-12 | 12-24
379 J | 883 J	Fluorene	0-12 | 12-24
2520 | 3530	Indeno(1,2,3-cd)pyrene	0-12 | 12-24
3300 | 7450	Phenanthrene	0-12 | 12-24
6120 | 8650	Pyrene	0-12 | 12-24

Value (mg/kg)	Parameter	Depth (In)
66.7 J | 317	Acenaphthene	0-12 | 12-24
ND | 421	Acenaphthylene	0-12 | 12-24
137 J | 1240	Anthracene	0-12 | 12-24
394 | 2800	Benzo(a)pyrene	0-12 | 12-24
378 | 2600	Benzo(b)fluoranthene	0-12 | 12-24
298 | 1960	Benzo(g,h,i)perylene	0-12 | 12-24
338 | 2310	Benzo(k)fluoranthene	0-12 | 12-24
420 | 2830	Chrysene	0-12 | 12-24
796 | 5170	Fluoranthene	0-12 | 12-24
ND | 427	Fluorene	0-12 | 12-24
271 | 1810	Indeno(1,2,3-cd)pyrene	0-12 | 12-24
445 | 3300	Phenanthrene	0-12 | 12-24
703 | 4580	Pyrene	0-12 | 12-24

0 200 400 800 FEET

Graphic Scale in Feet

N

Sources: USGS 1972 Historic Aerial Imagery

Includes samples from the EPA 2011 and DEC OLCC 2010 surveys.

Only detected results shown. PAHs not sampled in all locations as compared with PCB and metal data.

Project Number: 31.0180000.00

Onondaga County, New York

Legend:

- Sample Location
- Approximate Boundary of the City of Syracuse 1966 Landfills
- Approximate Boundary of the City of Syracuse 1972 Landfills

LOWER LEY CREEK

POLYCYCLIC AROMATIC HYDROCARBON VALUES

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6296 Fly Road, East Syracuse, NY 13057

FIGURE 5

Legend: Approximate Boundary of the City of Syracuse 1966 Landfills

0 1,250 2,500 FEET

N

Sources: USGS 1966 Historic Aerial Imagery

Project Number: 31.0180000.00

Onondaga County, New York

LOWER LEY CREEK

1966 HISTORIC AERIAL

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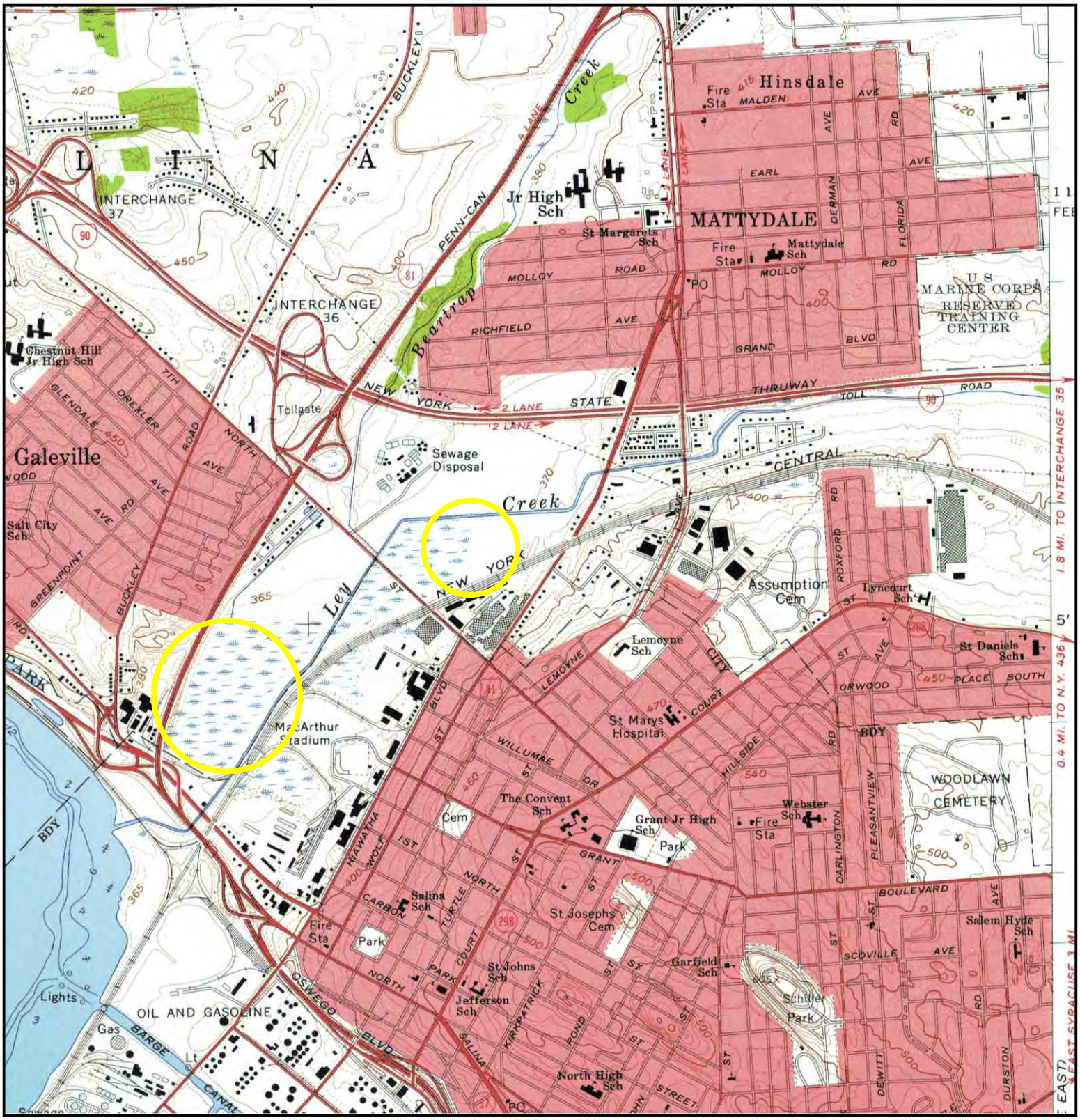
6296 Fly Road, East Syracuse, NY 13057

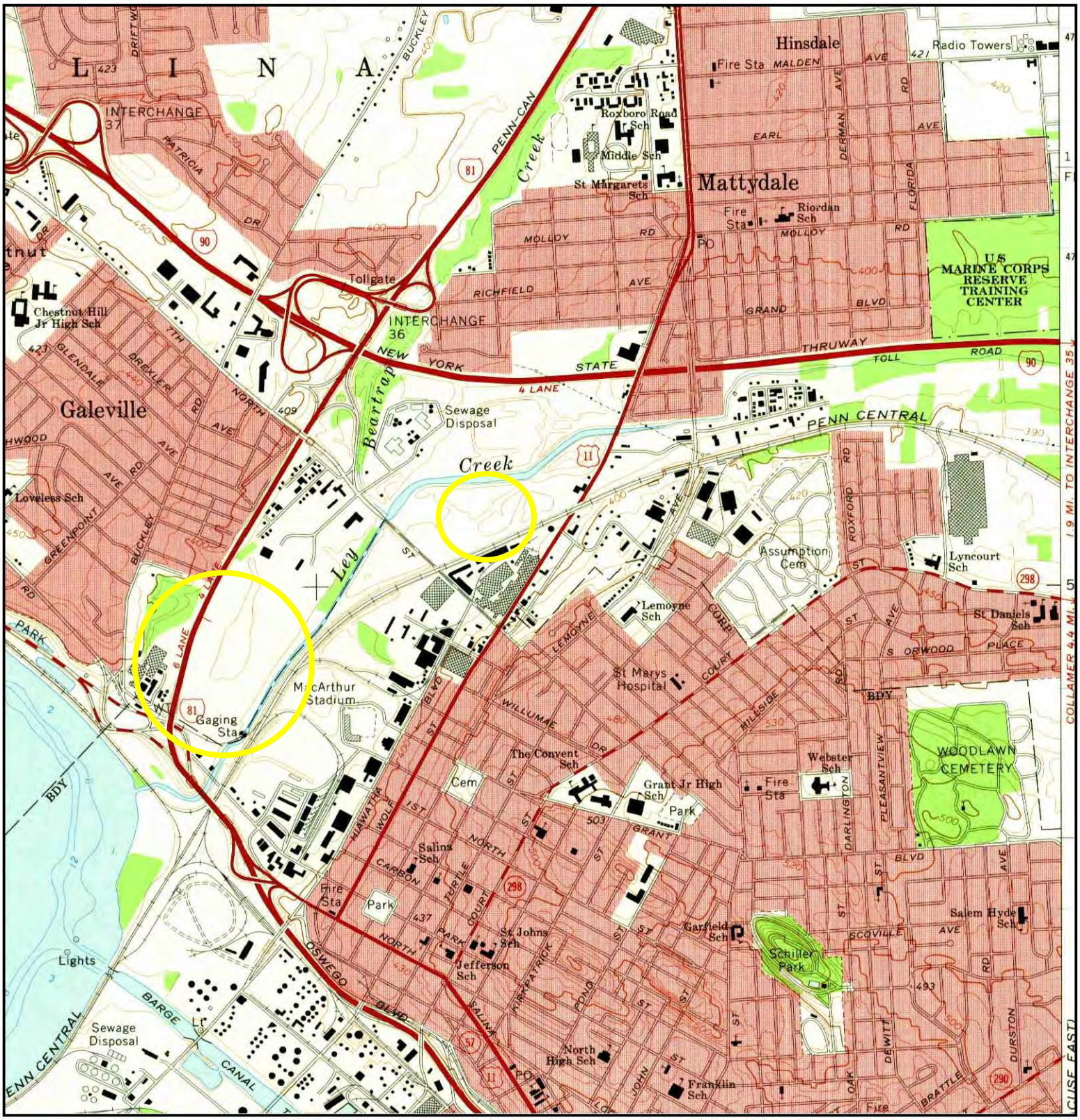
FIGURE 6

Historical Topographic Map



N	TARGET QUAD NAME: SYRACUSE WEST MAP YEAR: 1958 SERIES: 7.5 SCALE: 1:24000	**Notes:** General Locations of historic City of Syracuse landfill operations.	PALMERTON GROUP A Division of GZA GeoEnvironmental, Inc. **Figure 7 :** **1958 USGS Topographic Map**

Historical Topographic Map



N	TARGET QUAD NAME: SYRACUSE WEST MAP YEAR: 1973 SERIES: 7.5 SCALE: 1:24000	**Notes:** General Locations of historic City of Syracuse landfill operations.	PALMERTON GROUP A Division of GZA GeoEnvironmental, Inc. **Figure 8 :** **1973 USGS Topographic Map**

Figure 9, from *A Compilation of Landfill Practices in Onondaga County*, 1979

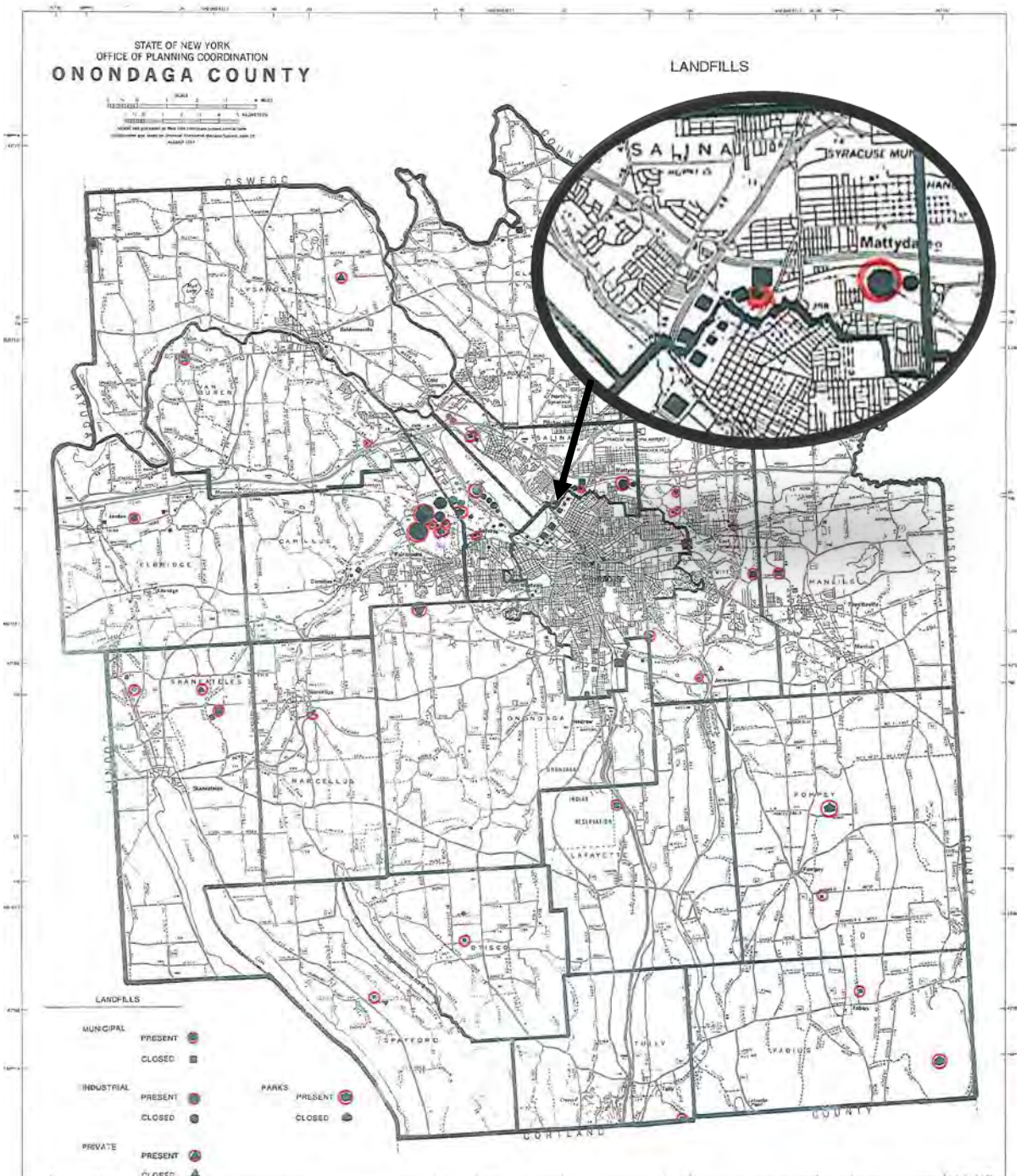
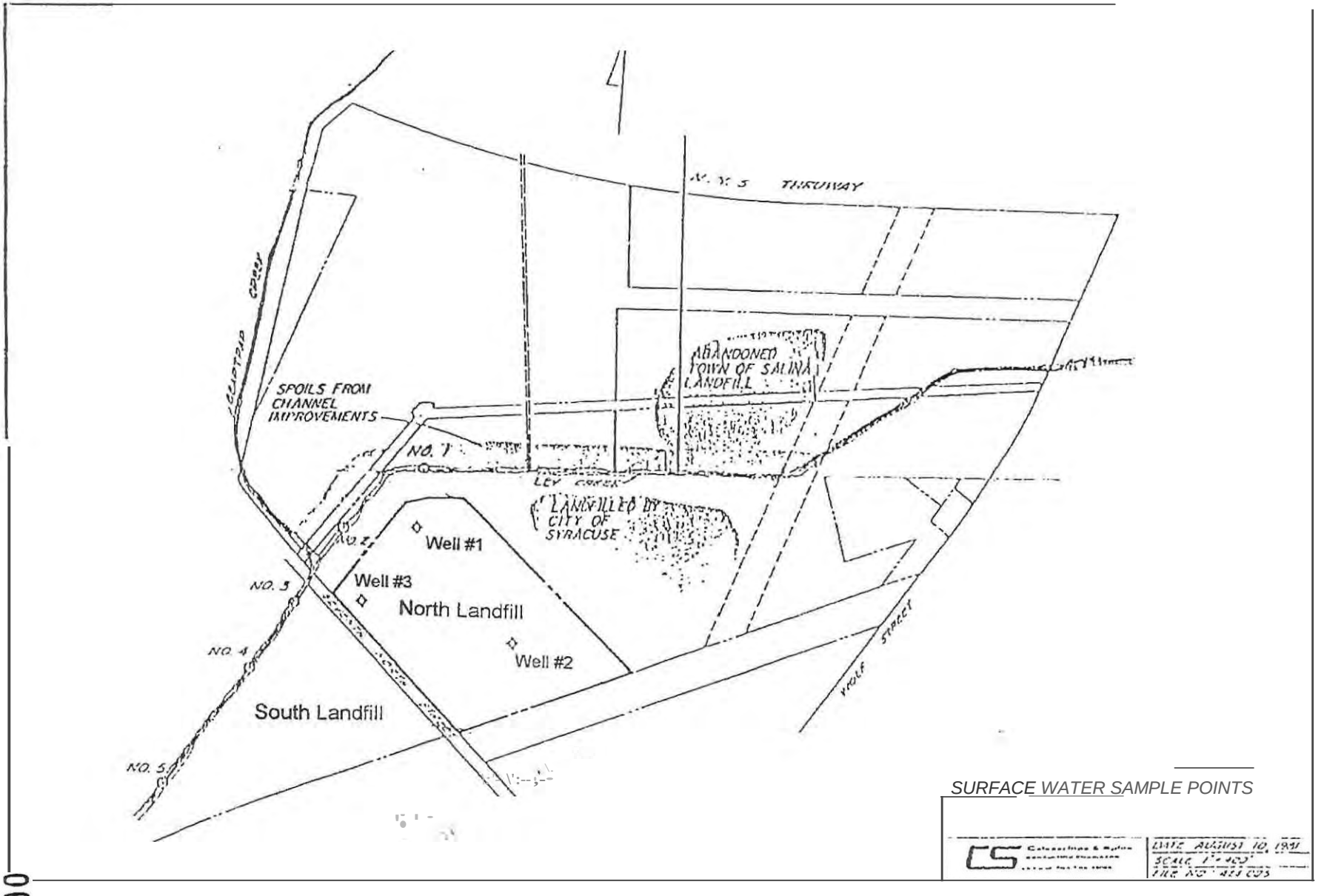


Figure 10, Location of City of Syracuse Landfill Near 7th North Street



Source: Calocerinos & Spina, 1981

North Landfill Groundwater and Ley Creek Surface Water Sample Locations

Figure 11, Onondaga Lake Survey, USEPA 1971.

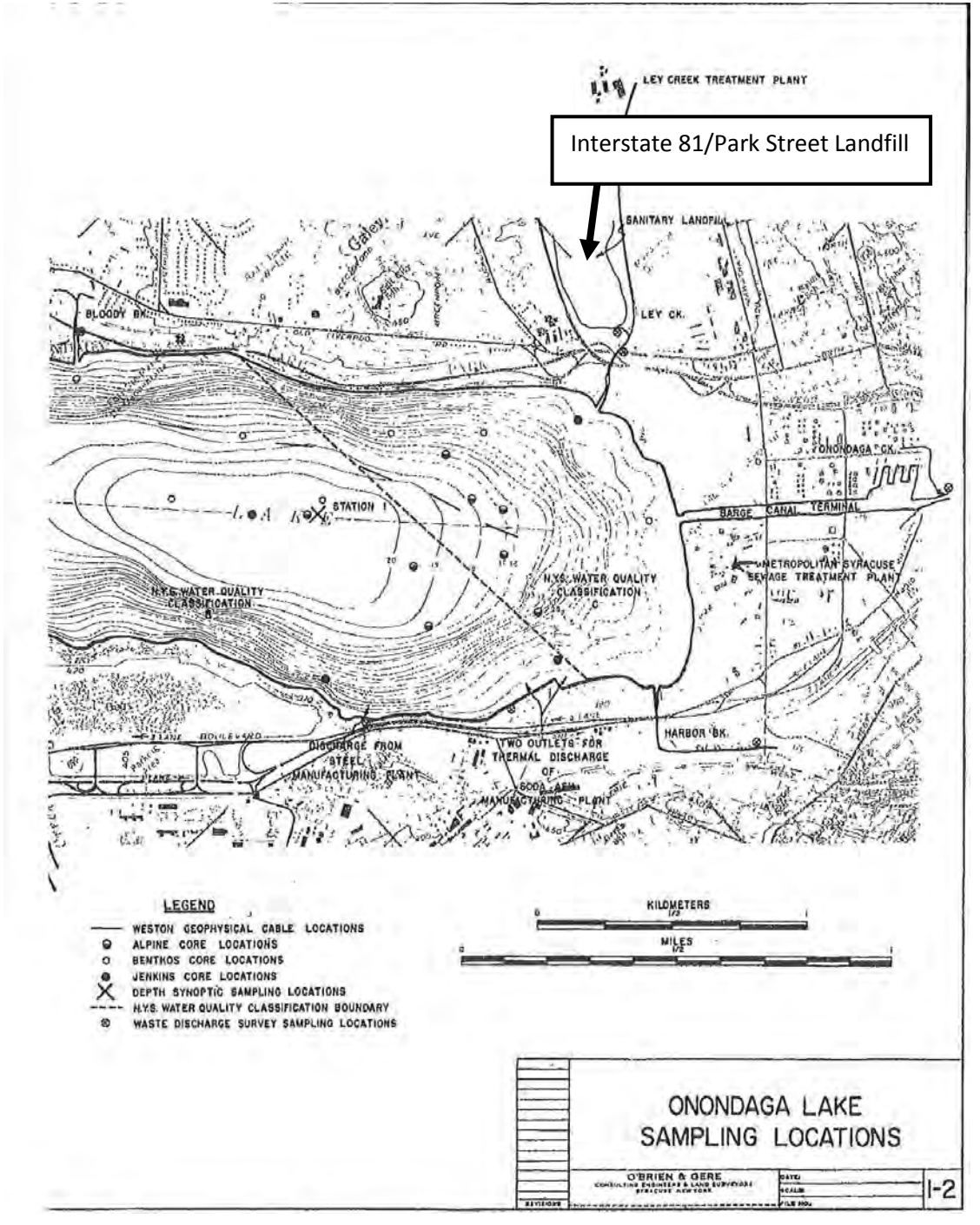
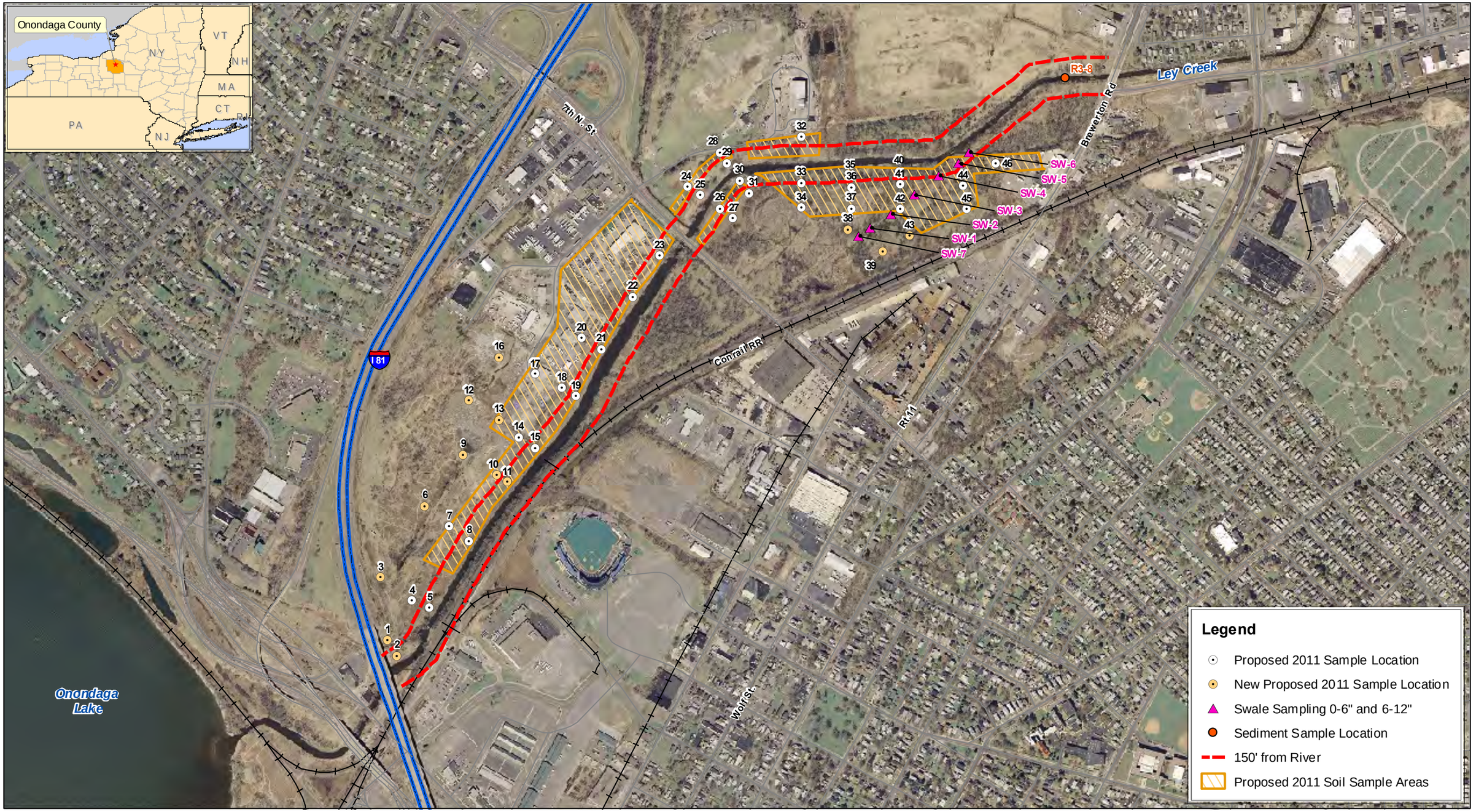


Figure 12, proposed 2011 USEPA sample locations



Base map created using color digital orthoimagery of New York state, site survey GPS data.

Map Creation Date: August 2010

Coordinate system: New York State Plane Central
FIPS: 3102
Datum: NAD83
Units: Feet

Data: g:\ArcViewprojects\SERAS\00-007
MXD file: g:\ArcInfoprojects\SERAS\SER00007_Lower Ley Creek/007_UFPQAPP4_2011_Proposed_Sediment_Sample_Locations_f1.mxd

750 0 750
Feet

N
W E
S

U.S EPA Environmental Response Team Scientific Engineering Response and Analytical Services EP-W-09-031 W.A.# 0-007	Figure 1 2011 Proposed Sediment Sampling Locations Lower Ley Creek Superfund Syracuse, New York